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## Pravin Bano

Department of Veterinary  
Pathology, College of Veterinary  
and Animal Sciences, Bikaner,  
Rajasthan, India

## V Punia

Department of Veterinary  
Parasitology, College of  
Veterinary and Animal Sciences,  
Udaipur, Rajasthan, India

## H Dadhich

Department of Veterinary  
Pathology, College of Veterinary  
and Animal Sciences, Bikaner,  
Rajasthan, India

## M Mathur

Department of Veterinary  
Pathology, College of Veterinary  
and Animal Sciences, Bikaner,  
Rajasthan, India

## I Vyas

Department of Veterinary  
Pathology, College of Veterinary  
and Animal Sciences, Bikaner,  
Rajasthan, India

## M Mehra

Department of Veterinary  
Pathology, College of Veterinary  
and Animal Sciences, Bikaner,  
Rajasthan, India

## S Asopa

Department of Veterinary  
Pathology, College of Veterinary  
and Animal Sciences, Bikaner,  
Rajasthan, India

## Corresponding Author

### Pravin Bano

Department of Veterinary  
Pathology, College of Veterinary  
and Animal Sciences, Bikaner,  
Rajasthan, India

## Pathological findings of inflammatory conditions related to heart of sheep (*Ovis aries*)

**Pravin Bano, V Punia, H Dadhich, M Mathur, I Vyas, M Mehra and S Asopa**

### Abstract

The study was conducted to elucidate the pathological findings of inflammatory conditions i.e. pericarditis, myocarditis and endocarditis related to heart of sheep (*Ovis aries*). Cardiovascular system was examined with total 587 samples, irrespective of age, breed and sex. Out of these, suspected 147 specimens of heart with pathological abnormalities were processed for histopathological examination. Inflammatory conditions i.e. myocarditis, endocarditis and pericarditis were recorded in 11 cases with occurrence of 7.48 per cent. In cases of pericarditis macroscopically heart showed discoloration and congested blood vessels. On microscopic examination the pericardium showed infiltration of polymorphonuclear and mononuclear cells. In cases of myocarditis, macroscopically red discoloured areas on the ventricles were seen. Microscopically, severe infiltration of polymorphonuclear and mononuclear cells was seen in myocardium. In cases of endocarditis macroscopically haemorrhagic areas were seen on endocardial layer of ventricles. On microscopic examination, infiltration of mononuclear and polymorphonuclear cells was seen in endocardium.

**Keywords:** Sheep, heart, pericarditis, myocarditis, endocarditis, histopathology

### Introduction

India is an agriculture based country. Livestock plays important role in world agriculture sector. It contributes 40 per cent of the global value of agricultural output and supporting the livelihood. Small ruminants i.e. goat and sheep represent significant part of world livestock industry and more than 78 per cent of total annual global production comes from Africa and Asia. Sheep had originated from their ancestors *Ovis orientalis* and *Ovis vignei* (Ensminger, 1970) [7]. The total livestock population in the country is 535.78 Millions (20<sup>th</sup> livestock census). The total population of sheep in India is 74.26 Millions, with an increase by 14.1 per cent over previous census (20<sup>th</sup> Livestock census). Sheep contribute to the tune of 13.87 per cent to the total livestock population of the country. According to 20<sup>th</sup> livestock census, indigenous or non-descript sheep population is 70.17 Millions (94.49%) while exotic or crossbred sheep population is 4.09 Millions (5.51%). Rajasthan with 7.9 million sheep population is the 4<sup>th</sup> largest sheep rearing state of the country (20<sup>th</sup> livestock census).

The cardiovascular system is responsible for circulation of oxygenated and deoxygenated blood. It also helps in transporting various nutrients i.e. amino acids, electrolytes and sugar and help in removing gaseous wastes from the body. Various endocrine hormones, excretory products are also transported by cardiovascular system.

### Materials and Methods

Cardiovascular system was examined with total 587 samples, irrespective of age, breed and sex. Out of these, suspected 147 specimens of heart with pathological abnormalities were processed for histopathological examination. The samples were collected in 10 per cent formal saline and processed for histo-pathological examination. Processing of tissues was done by paraffin embedding using acetone and benzene technique (Lillie, 1965). The tissue sections of 4-6 micron thickness were cut with help of hand operated microtome and stained as per haematoxylin and eosin staining method (Luna, 1968) [15].

### Results and Discussion

The occurrence of inflammatory conditions of heart was observed in 7.48 per cent cases. The following number of cases were reported;

Name of inflammatory condition

A.	Name of inflammatory condition	No. of cases	% occurrence
1.	Pericarditis	5	3.40
2.	Myocarditis	2	1.36
3.	Endocarditis	4	2.72
	Total	11	7.48

**Pericarditis**

This condition was recorded in 5 cases. The occurrence of this condition was recorded as 3.40 per cent. This is in partial harmony with the findings of Raji *et al.* (2010) [18] as 6.3 per cent. Macroscopically heart showed discoloration and congested blood vessels (Fig.1). Macroscopic findings of pericarditis such as haemorrhages and necrotic appearance are in agreement with the findings of Abo-shehada *et al.* (1991) [1] and Jesty *et al.* (2005) [11]. On microscopic examination the pericardium showed infiltration of polymorphonuclear and mononuclear cells (Fig.2). Microscopic findings of pericardium such as infiltration of mononuclear cells in the pericardium agree well with findings of Hussain *et al.* (2017) [10]. Other microscopic findings of pericarditis such as fibrinous exudates and infiltration of cells are in accordance with Hussein and Staufenbiel, (2014) [9].

Based upon the findings of present investigation, it is appropriate to conclude that many etiological factors are responsible for pericardial inflammation. It may be caused by bacterial infection such as haemorrhagic septicaemia (De-Alwis, 1984) [6] and (Hussain *et al.*, 2017) [10]. Other bacterial infections such as *E. coli* are in accordance with Vegad and Katiyar (2001) [21].

**Myocarditis**

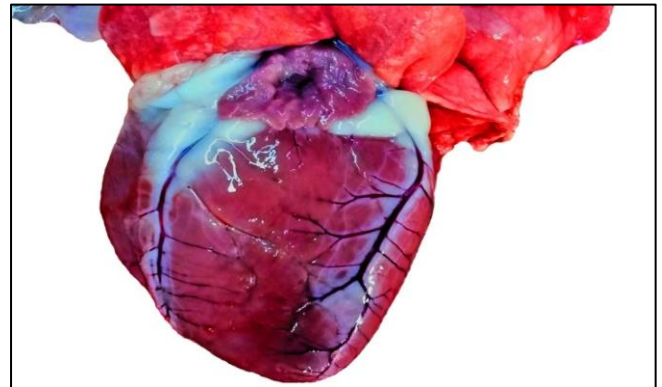
This condition was recorded in 2 cases. The occurrence of this condition was recorded as 1.36 per cent. Macroscopically red discoloured areas on the ventricles were seen. Microscopically, severe infiltration of polymorphonuclear and mononuclear cells was seen in myocardium (Fig.3 and 4). Microscopic findings of myocarditis such as aggregation and infiltration of polymorphonuclear and mononuclear cells are in close agreement with Dawood and Alsaad (2018) [5], Batista *et al.* (2019) [3] and Hamouda *et al.* (2019) [8]. Microscopically presence of haemorrhagic areas are in agreement with findings of Ashrafihelan *et al.* (2014) [2].

Many etiological factors are responsible for myocarditis such as bacteria, viruses and protozoa (Van Vleet and Ferrans, 1986) [20], trypanosomiasis (Batista *et al.*, 2019) [3] and *Histophilus somni* infection (Corbeil *et al.*, 2009) [4].

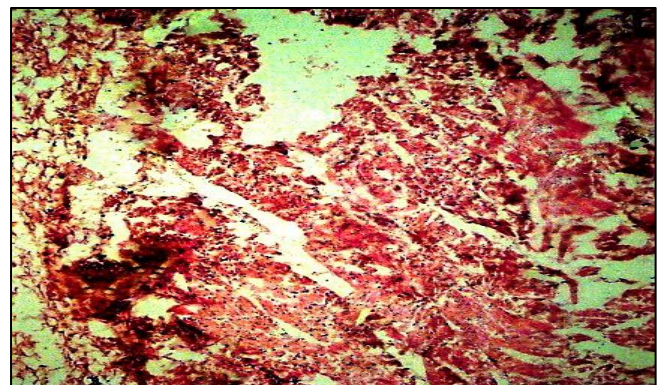
**Endocarditis**

This condition was recorded in 4 cases. The occurrence of this condition was recorded as 2.72 per cent. Macroscopically haemorrhagic areas were seen on endocardial layer of ventricles. On microscopic examination, infiltration of mononuclear and polymorphonuclear cells was seen in endocardium (Fig.5). Microscopic findings of endocarditis such as infiltration of mononuclear and polymorphonuclear cells are in accordance with Rudmann and Stevenson, (1993) [19] and karim *et al.* (2019) [12].

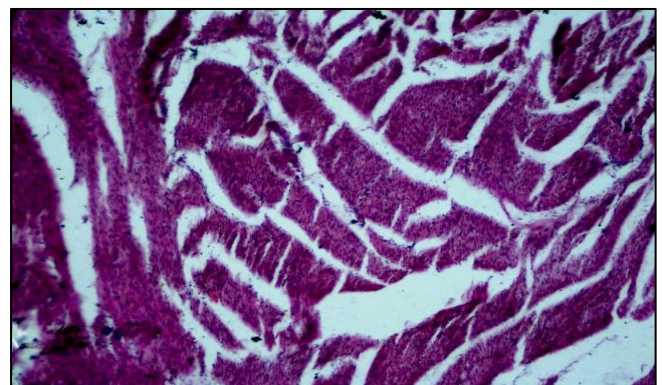
Endocarditis may be caused by bacterial infection (Power and Rebhun, 1983) [17]. Rudmann and Stevenson (1993) [19] found Staphylococcal infection and Bartonella infection was reported by Maillard *et al.*, 2007 [16].



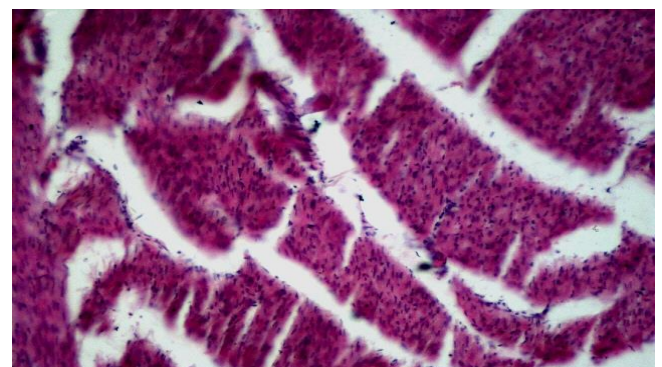
**Fig 1:** Photograph of heart of sheep showing congested blood vessels.



**Fig 2:** Microphotograph of pericardium of heart of sheep showing infiltration of polymorphonuclear and mononuclear cells along with mild haemorrhage (H&E, 200X).

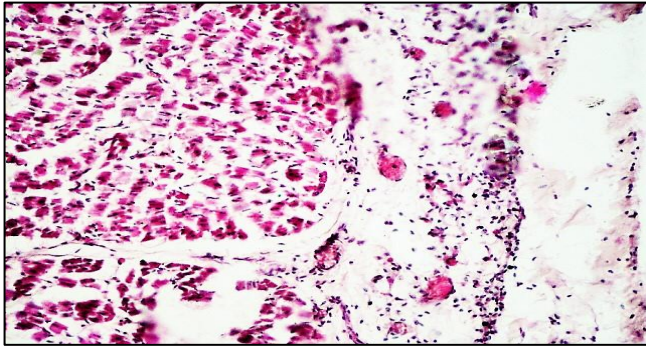


**Fig 3:** Microphotograph of myocardium of heart of sheep showing infiltration of polymorphonuclear and mononuclear cells (H&E, 100X).



**Fig 4:** Microphotograph of myocardium of heart of sheep showing infiltration of polymorphonuclear and mononuclear cells (H&E, 200X).





**Fig 5:** Microphotograph of endocardium of heart of sheep showing infiltration of mononuclear and Polymorphonuclear cells (H&E, 100X).

### Conclusion

It is concluded that the inflammatory conditions of heart of sheep are pathological abnormalities in sheep resulting in weakness of animal with poor performance which in turn leads to economic losses to the rural farmer.

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